$$\therefore\ p=\{\pi^2/[2r(\tfrac{4}{3}\pi r^3)^2]\}\int_0^{2r} x(3r-x)(2r-x)dx\int_{2r-x}^{2r}[y/(3r-x)][r^2-(3r-x-y)^2]dy$$

$$=(3/128r^7)\int_0^{2r}(14rx^5-x^6-48r^2x^4+48r^3x^3)dx=(3/128r^7)(1664r^7/105)=\tfrac{13}{35}.$$

$$2.\ \Delta=\{\pi^2/[2r(\tfrac{4}{3}\pi r^3)^2]\}\int_0^{2r} x(3r-x)(2r-x)dx\int_{2r-x}^{4r-x}[y^2/(3r-x)][r^2-(3r-x-y)^2]dy$$

$$=(3/40r^4)\int_0^{2r}(92r^3x-106r^2x^2+40rx^3-5x^4)dx=(3/40r^4)(88r^5/3)=11r/5.$$

80. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

A box contains 100 balls marked from 1 to 100. 13 balls are drawn at random. What is the chance that the balls marked from 1 to 10 are included in the 13 drawn?

Solution by J. W. YOUNG, Columbus, Ohio.

Since in all the favorable chances only three balls may vary, the total number of favorable chances is ${}^{90}C_3$, *i. e.*, the number of combinations of 90 things taken 3 at a time.

The total number of ways in which the balls may be drawn is, of course, ${}^{100}C_{13}$.

Hence the desired probability is equal to

$$\frac{{}^{90}C_3}{{}^{100}C_{13}}=\frac{\dfrac{90.89.88}{1.2.3}}{\dfrac{100.99.98.97.96.....89.88}{1.2.3.5.....13}}=\frac{1}{67515927540}.$$

PROBLEMS FOR SOLUTION.

ARITHMETIC.

124. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Science, Decorah Institute, Decorah, Iowa.

At what time between 5 and 6 o'clock is the minute hand midway between 12 and the hour hand? When is the hour hand midway between 4 and the minute hand?